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A Test of Containers and Method of Storage for Spring Lifting of Nursery Stock

by

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A test of two containers, the regular poly-lined kraft bag and the "Plant-Fresh"[1] bag, was made at the Swastika Tree Nursery in the spring of 1973. The stock used in the experiment was 3-0 black spruce (Picea mariana (Mill.) B.S.P.), which averaged 25.8 cm in top length, 0.44 cm in diameter, 4.89 g in oven-dry mass, and 4.62:1 in top-root ratio by oven-dry mass. The 40 kraft bags and 40 "Plant-Fresh" bags were packed on May 25 with 300 freshly-lifted trees per bag. In half of the containers of each type a handful of wet sphagnum moss was placed on top of the trees. The remaining containers were packed without moss.

After packaging, half of the containers were put into refrigerated storage maintained at approximately 2.5°C, and the remainder were placed outside on pallets in a shaded area. The kraft bags placed outside were covered with a plastic sheet to prevent rain damage during storage, but air circulation was not inhibited.

At the end of two weeks (June 7), 5 bags of each treatment were taken to the planting site on the nursery and samples of 50 trees were randomly removed from each bag for planting. All planting was by Sandvik hoe in cultivated soil. The air temperature was 22°C, soil temperature 14°C and relative humidity 45-55%. The second planting at the end of four weeks was on June 22, when the air temperature was 20°C, soil temperature 13°C and relative humidity 65-90%.

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[1] A two-layer, special film, transport bag, patented, supplied through the courtesy of ES & A Robinson (Canada) Ltd., 69 Laird Drive, Toronto, Ontario.

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Tabular Outline of the Experiment

Treatments	1. KB-D-U = Kraft bag, dry, unrefrigerated 2. KB-M-U = Kraft bag, moss, unrefrigerated 3. KB-D-R = Kraft bag, dry, refrigerated 4. KB-M-R = Kraft bag, moss, refrigerated 5. PF-D-U = "Plant-fresh", dry, unrefrigerated 6. PF-M-U = "Plant-fresh", moss, unrefrigerated 7. PF-D-R = "Plant-fresh", dry, refrigerated 8. PF-M-R = "Plant-fresh", moss, refrigerated
Plantings	After two-week storage = June 7, 1973 After four-week storage = June 22, 1973
Planting Design	Fully randomized, 8 treatments in 5 replications, 40 plots of 50 trees each. Separate designs for 2-week and 4-week plantings but in adjacent blocks.
Records	Survival and terminal lengths (current year's growth) obtained in fall 1974, second growing season after planting.

Results and Discussion

The second year results have been summarized in Table 1 by treatments and by effects of container, refrigeration, and addition of moss. The statistical analyses were performed separately for the 2-week and 4-week storage plantings. Inferences drawn must be confined to the restraints of the experiment, viz. one species, one lift (towards the end of the normal spring planting time), and spring lifting (as opposed to possible differences due to fall lifting and overwinter storage).

Under these conditions the "Plant-Fresh" bag apparently offered no improvement over the regular kraft bag for stock storage of two weeks, and was in fact inferior in terms of survival for storage after four weeks.

Secondly, the refrigerated storage apparently was damaging for short storage (particularly in the "Plant-Fresh" bag), but beneficial for longer storage. This may have been due to late-season lifting. It should be pointed out, however, that the late planting of June 22 (4-week storage) has resulted in inhibited growth, an effect carried into the second year and probably to continue in a dwarfing effect on the plantation (average terminals, second year, all treatments: 2-weeks = 4.07 cm, 4-weeks = 3.35 cm).

Finally, the effect of adding a handful of wet moss was apparently very minor for the 2-week holding, but did significantly improve the growth rate for the 4-week holding, both refrigerated and unrefrigerated.

TABLE 1. Second year survival and terminal growth for 3-0 black spruce planted at Swastika, Ontario, June 1973

	2-week storage		4-week storage	
	Survival %	Terminal cm	Survival %	Terminal cm
Treatments				
Kraft bag				
KB-D-U	96.8b	4.17	87.2bc	3.43ab
KB-M-U	95.2ab	3.78	80.4ab	3.54ab
KB-D-R	91.6ab	2.89	93.6c	2.54a
KB-M-R	92.0ab	4.07	93.2c	3.81ab
"Plant-Fresh"				
PF-D-U	97.2b	4.81	75.6ab	3.36ab
PF-M-U	96.8b	4.46	71.6a	3.68ab
PF-D-R	87.2a	3.42	94.4c	2.53a
PF-M-R	87.6a	4.91	85.6b	4.11b
	**	NS	***	**
Container Effect				
Kraft bag	93.9	3.74	88.6	3.32
"Plant-Fresh"	92.2	4.41	81.8	3.38
	NS	NS	*	NS
Refrigeration				
Unrefrigerated	96.5	4.31	78.7	3.50
Refrigerated	89.6	3.81	91.7	3.22
	**	NS	***	NS
Moss Effect				
Dry	93.2	3.85	87.7	2.93
Wet	92.9	4.30	82.7	3.80
	NS	NS	NS	*

The letters (a, b, c) after the figures indicate where significant differences occur according to the Duncan range test. Thus, in column #1 (survival after 2-week storage) all figures for treatments which are followed by the letter "a" cannot be shown to be statistically different from each other at the 5% level or better.

An analysis of variance was done for each set of eight figures above the asterick(s).

* = Significant at 5.0% level
** = Significant at 1.0% level
*** = Significant at 0.1% level